Fault Protection Code and Troubleshooting Guide

INVERTER POWER SWITCH TURNED ON

Trouble/Indication	Possible Cause	Suggested Remedy
No AC output — (red LED lit	DC input is out of range	Check battery voltage.
	Excessive load — thermal shutdown	Turn unit off. Reduce the load, wait for the inverter to cool down, then turn the unit on again.
No AC output — green LED not lit	Fuse(s) open	Check DC input — fuse(s) in vehicle. Replace the fuse with one of the same type and rating if necessary.
Low battery alarm sounds continuously	Low battery voltage	Recharge battery. Remove load from the inverter while recharging battery.
	Bad connection or wiring	Tighten all DC connections.
Motorized power tool will not start	Excessive start-up load	If appliance does not start, appliance is drawing excessive voltage and will not work with inverter.
Motorized power tool does not operate at correct speed	Purely inductive load	Make the load not purely inductive. Operate an incandescent lamp at the same time as motor.
Television/Radio interference	Snow in picture, "buzzing" sound	Keep inverter and antenna distant from each other. Use shielded antenna. Connect antenna to amplifier.

SPECIFICATIONS

Power Inverter Model	VEC1045BD	VEC1046BD	VEC1047BD
Maximum Continuous Power:	200 watts	400 watts	750 watts
Surge Capacity:	400 watts	800 watts	1500 watts
Input Voltage:	12.8 volts		
Output Voltage:	Approx. 115 volt AC RMS 60 Hz		
Low Voltage Alarm:	11 volts DC ± 0.3 volt DC		
Low Voltage Shutdown:	10.5 volts DC ± 0.3 volt DC		
Thermal Shutdown:	Automatic		
Wave Form:	Modified Sine Wave (MSW)		
Output Connection:	North American Standard Receptacles		
Input Fuses:	Internal		
Input Cables:	Battery cable with ring connector		
Additional Protection:	Overload, over voltage, overheating		

VEC1045BD / VEC1046BD / VEC1047BD

BLACK&DECKER®

VEHICLE POWER SYSTEM

POWER INVERTER

200/400/750 WATT

USER'S MANUAL & WARRANTY INFORMATION

IMPORTANT SAFETY INFORMATION, SAVE THESE INSTRUCTIONS

TO REDUCE THE RISK OF INJURY, USER MUST READ AND UNDERSTAND THIS INSTRUCTIONAL MANUAL. THIS MANUAL CONTAINS IMPORTANT INFORMATION REGARDING THE OPERATION AND WARRANTY OF THIS PRODUCT. PLEASE RETAIN FOR FUTURE REFERENCE.

4140 S.W. 30th Ave., Ft. Lauderdale, FL 33312
Toll Free: (800) 618-5178

www.vectormfg.com

IMPORTANT SAFETY INSTRUCTIONS

To ensure reliable service, your power inverter must be installed and used properly. Please read the installation and operating instructions thoroughly prior to installation and use. Pay particular attention to the WARNING and CAUTION statements in this manual. The CAUTION statements advise against certain conditions and practices that may result in damage to your inverter. The WARNING statements identify conditions or practices that may result in personal injury.

Read All Instructions Before Using This Power Inverter!

WARNINGS

TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, EXPLOSION OR INJURY:

- **Do not connect to AC distribution wiring.**
- **Remove appliance plug from outlet strip or turn off inverter before working on the appliance. Multiple outlet power strips with switches and circuit breakers only interrupt power to the "hot" receptacle terminals. The "neutral" terminals remain powered with respect to the "ground" terminals.**
- **NOT approved for ignition protected areas. Do not make any electrical connections or disconnections in areas designated as IGNITION PROTECTED.**
- **This is not a toy — keep away from children.**
- **This equipment employs components that tend to produce arcs or sparks. DO NOT install in compartments containing batteries or flammable materials.**
- **Use this unit in properly ventilated areas ONLY.**
- **Do not open — there are no user-serviceable parts inside.**
- **Do not insert foreign objects into the outlet.**
- **Do not expose the unit to water, rain or snow.**

CAUTIONS

- **Always inspect battery supply connections and cables to ensure they are tight and that cable insulation is not damaged.**
- **Do not use with positive ground electrical systems (the majority of modern automobiles, RVs, trucks and boats are negative ground). Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter and will void warranty.**
- **This inverter will not operate high wattage appliances or equipment that produce heat, such as hair dryers, microwave ovens and toasters.**
- **Grounding the Neutral will cause the inverter to shut down. Do not operate this inverter if it is wet. Do not install in engine compartment — install in a well ventilated area.**
- **This inverter has not been not tested for use with medical devices.**
- **Do not attempt to install or operate this unit while operating a motor vehicle.**

FOR USAGE ABOVE 100 WATTS:

- **Use battery clips ONLY.**
- **DO NOT use the DC accessory plug or the fuse will open.**

Important Cable Information

Substantial power loss and reduced battery operating time results from inverters installed with cables that are not able to supply full power. Symptoms of low battery power can result from cables that are either excessively long or an insufficient gauge. Marine installations are also subjected to vibration and stresses that exceed those of other mobile installations. Therefore, the installer/operator should be especially aware of the requirements to maintain secure, tight, water-resistant electrical connections and to provide for strain relief for DC cables and appliance wiring. Cable insulation must be the appropriate type for the environment.

SAVE THESE INSTRUCTIONS

TWO YEAR LIMITED WARRANTY PROGRAM

This limited warranty program is the only one that applies to this product, and it sets forth all the responsibilities of Vector Manufacturing, Ltd., regarding this product. There is no other warranty, other than those described herein.

This Vector Manufacturing product is warranted, to the original purchaser only, to be free of defects in materials and workmanship for two years from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users. Manufacturer will not be responsible for any amount of damage in excess of the retail purchase price of the product under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This product is not intended for commercial use. This warranty does not apply to accessories or damage to units from misuse or incorrect installation. Misuse includes wiring or connecting to improper polarity power sources.

RETURN/REPAIR POLICY: Defective products, other than accessories, may be returned postage prepaid to manufacturer. Any defective product, other than accessories, that is returned to manufacturer within 30 days of the date of purchase will be replaced free of charge. If such a product is returned more than 30 days but less than two years from the purchase date, manufacturer will repair the unit or, at its option, replace it free of charge.

If the unit is repaired, new or reconditioned replacement parts may be used, at manufacturer's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under the terms of the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items after 30 days. During the warranty period, manufacturer will be responsible for the return shipping charges.

LIMITATIONS: This warranty does not cover accessories, bulbs, fuses and batteries, defects resulting from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire, flood and Acts of God.

If your problem is not covered by this warranty, call Technical Support at (800) 618-5178 for general repair information and charges, if applicable. You may also contact us through our website at www.vectormfg.com.

STATE LAW RIGHTS: This warranty gives you specific legal rights. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the exclusions or limitations stated herein may not apply. This warranty gives the purchaser specific legal rights; other rights, which vary from state to state, may apply.

TO REQUEST WARRANTY SERVICE FOR THIS PRODUCT: Contact Technical Support by telephone, fax or mail (see below). We suggest that you keep the original packaging in case you need to ship the unit. When returning a product, include your name, address, phone number, dated sales receipt (or copy) and a description of the reason for return and product serial number. After repairing or replacing the unit, we will make every effort to return it to you within four weeks.

WARRANTY ACTIVATION: Please complete Warranty Activation Card and mail to Vector Manufacturing, Ltd. Enter the model number as Model and "Vehicle Power System Power Inverter" as Product Type. All Vector products must be registered within 30 days of purchase to activate this warranty. Mail the completed registration form, along with a copy of the original sales receipt to:

ATTN.: CUSTOMER SERVICE
4140 SW 30th Ave., Ft. Lauderdale, FL 33312
TOLL FREE: (800) 618-5178

WARRANTY IS NON-TRANSFERABLE AND NON-REFUNDABLE.

BD042605

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MADE IN CHINA

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INTRODUCTION

Thank you for purchasing a ***Black & Decker Power Inverter.*** Please read this guide carefully before use to ensure optimum performance and to avoid damage to this product.

FEATURES

The front panel provides two LED indicators. The green LED indicates power and proper operation of the inverter, the red LED indicates inverter shutdown from over-load or over-temperature condition, or abnormal input voltages.

An ON/OFF Switch turns the inverter ON and OFF. The switch can also be used to force reset of inverter circuits by switching it OFF, then back ON again.

AC power is supplied through grounded standard North American household-type outlets. The VEC1045BD features one outlet; the VEC1046BD and VEC1047BD feature two. The outlets can accommodate either two- or three-pin AC plugs. Power may also be supplied through the 12 volt DC outlet on the VEC1045BD (only).

Figure 1. VEC1045BD Front Panel

1. **Warning LED**
2. **Power LED**
3. **ON/OFF Switch**
4. **AC Outlet**
5. **12 Volt DC Outlet**

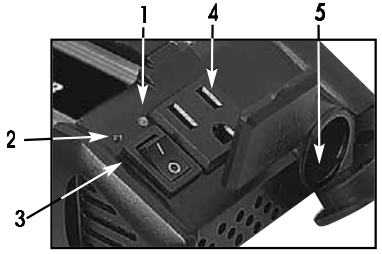


Figure 2. VEC1046BD/1047BD Front Panel

1. **Power LED**
2. **Warning LED**
3. **ON/OFF Switch**
4. **AC Outlets**

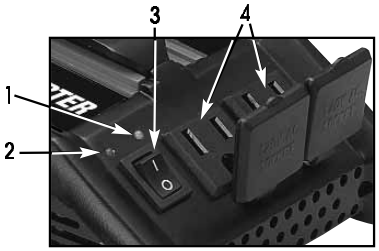
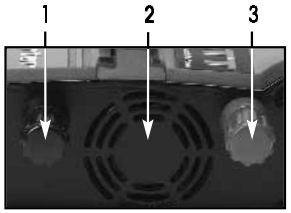


Figure 4. Rear Panel (All Models)

1. **Negative (–) DC Power Connection**
2. **High-Speed Cooling Fan**
3. **Positive (+) DC Power Connection**



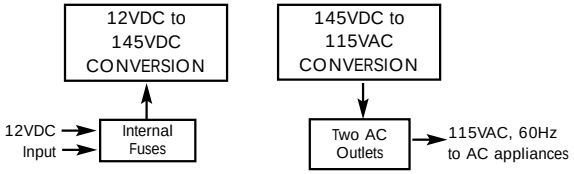
HOW THIS INVERTER WORKS

The inverter converts low voltage DC (direct current) from a battery or other power source to standard 120 volt AC (alternating current) household power.

Principle of Operation

The inverter converts power in two stages. The first stage is a DC-to-DC conversion process that raises the low voltage DC at the inverter input to 145 volts DC. The second stage is the actual inverter stage that converts the high voltage DC into 115 volts, 60 Hz AC.

The DC-to-DC converter stage uses modern high frequency power conversion techniques that have replaced the bulky transformers found in less technologically-advanced models. The inverter stage uses advanced power MOSFET transistors in a full bridge configuration. This ensures excellent overload capability and the ability to operate reactive loads like small induction motors.

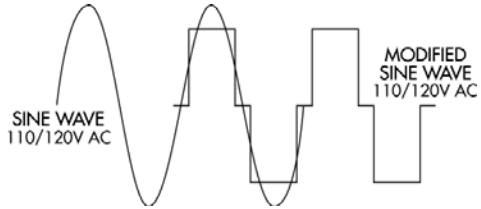


The Power Inverter Output Waveform

The AC output waveform of the Power Inverter is known as “modified sine wave.” It is a waveform that has characteristics similar to the sine wave shape of utility power. This type of waveform is suitable for most AC loads, including linear and switching power supplies used in electronic equipment, transformers, and motors.

The modified sine wave produced by the Power Inverter has an RMS (root mean square) voltage of 115 volts, which is the same as standard household power. Most AC voltmeters (both digital and analog) are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage under the assumption that the waveform measured will be a pure sine wave. These meters will not read the RMS voltage of a modified sine wave correctly. They will read about 20 to 30 volts low when measuring the output of the inverter. For accurate measurement of the output voltage of this unit, use a true RMS reading voltmeter such as a Fluke 87, Fluke 8060A, Fluke 77/99 series, Beckman 4410, or Triplett 4200.

Modified Sine Wave and Sine Wave Comparison



OPERATING INSTRUCTIONS

Power Source Requirements

The power source must provide 12.5 volts DC and must be able to supply the necessary current to operate the load. The power source may be a battery or a well-regulated DC power supply. To obtain a rough estimate of the current (in amperes) the power source must deliver, simply divide the power consumption of the load (in watts AC) by 10.

Example: If a load is rated at 200 watts AC, the power source must be able to deliver: 200 divided by 10 = 20 amperes

⚠CAUTION

The Power Inverter must be connected only to batteries with a nominal output voltage of 12 volts. The unit will not operate from a 6 volt battery and will sustain permanent damage if connected to a 24 volt battery.

Connection to Power Source

The Power Inverter comes equipped with a DC accessory outlet plug and battery clip cables for connection to a power source (Models 1045BD and 1046 BD only).

Connecting to a Power Source Using the Accessory Outlet Plug

The DC accessory outlet plug is suitable for operating the inverter at power outputs up to 100 watts. The tip of the plug is POSITIVE (+) and the side contact is NEGATIVE (–).

Connect the inverter to the power source by inserting the DC accessory outlet plug firmly into the accessory outlet of a vehicle or other DC power source.

⚠CAUTIONS

- **Connect directly to power source when operating above 100 watts.**
- **Do not use with positive ground electrical systems.**
- **Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter.**

Notes: ***Most vehicle accessory outlet circuits have fuses rated at 15 to 20 amps or greater. To operate at full wattage, either use the battery clip cable (supplied) or directly wire to the power source with user-supplied wire and fuse.***
The majority of modern automobiles, RVs and trucks are negative ground.

Run Times

The Power Inverter may be used whether or not the vehicle's engine is running. However, the inverter may not operate while the engine is starting since the battery voltage can drop substantially during cranking.

The unit draws less than 0.5 ampere from the battery when it is not supplying power to a load and switch is in ON position. In most instances, it can be left connected to the battery when not in use, since it draws so little current. However, if the vehicle is to remain unused for several days, disconnect the Power Inverter from the battery.

Rated Versus Actual Current Draw of Equipment

Most electrical tools, appliances and audio/video equipment have labels that indicate the power consumption in amps or watts. Be sure that the power consumption of the item you wish to operate is rated at or lower than the inverter's output rating. If the power consumption is rated in amps AC, simply multiply by the AC volts (115) to determine the wattage. The Power Inverter has overload protection, and will shut down if it is overloaded.

Resistive loads are the easiest for the Power Inverter to run. However, larger resistive loads, such as electric stoves or heaters, usually require more wattage than the Power Inverter can deliver on a continuous basis. Inductive loads, such as TV's and stereos, require more current to operate than do resistive loads of the same wattage rating. Induction motors, as well as some televisions, may require 2 to 6 times their wattage rating to start up. The most demanding appliances are those that start under load, such as compressors and pumps. Testing is the only way to determine whether a specific load can be started and how long it can run. The unit will simply shut down if it is overloaded.

The unit should automatically restart after a shutdown due to overloading once the load is reduced. If it fails to do so, manually reset using the inverter's ON/OFF switch.

⚠CAUTION

This inverter will not operate high wattage appliances or equipment that produce heat, such as hair dryers, microwave ovens, and toasters.

Protective Features of the Inverter

The Power Inverter monitors the following potentially hazardous conditions:

Low Battery Voltage — This condition is not harmful to the inverter, but could damage the power source. An alarm will sound when input voltage drops to 11.0 Volts. The Power Inverter automatically shuts down when input voltage drops to 10 volts. When the condition is corrected, the inverter can be turned off, then turned back on.

Over Voltage Protection — The Power Inverter will automatically shutdown when the input voltage exceeds 15.5 volts DC ± .5 volt DC.

Short Circuit Protection — Reverse polarity or short circuit condition may cause external or internal fuses to open and may cause irreversible damage to the Power Inverter. Take extra care to insure a proper polarity hook-up.

Overload Protection — The unit will automatically shut down when the continuous draw exceeds the unit's rated output. The unit should automatically restart after a shutdown due to overloading once the load is reduced. If it fails to do so, manually reset using the inverter's ON/OFF switch.

Over Temperature Protection — If the temperature inside the Power Inverter reaches 150°F, the unit will automatically shut down. Allow the unit to cool for at least 15 minutes before restarting after a heat-related shutdown. Unplug unit while cooling.

If the low voltage alarm sounds when the battery is fully charged, follow the steps for solving lack of output power in the Troubleshooting section of this manual. The alarm will sound if there is an excessive voltage drop between the battery and the inverter.

Note: ***It is normal for the alarm to sound while the unit is being connected to, or disconnected from, the power source. This is not indicative of a problem.***

Connecting to a Power Source Using the Provided Cables

Use the provided cables and connect the Power Inverter directly to the 12 volt power source as follows:

1. Make sure the Power Inverter power is turned OFF and that no flammable fumes are present in the installation area.
2. Connect the RED cable to the RED post marked (+) on the back of the inverter . Connect the battery clip to the POSITIVE terminal of the battery.
3. Connect the BLACK cable to the BLACK post marked (–) on the back of the inverter. Connect the battery clip to the NEGATIVE terminal of the battery.
4. Make sure that all connections between battery clips and terminals are secure.

Direct Hardwiring to Power Source

Use #12 AWG wire if the inverter to power source connection is 4 feet or less. For longer cable lengths use #8 AWG wire for lengths to 10 feet. In either case, protect the positive (+) wire from shorts by installing a 50 to 75 Amp fuse or circuit breaker close to the DC power source (battery) terminal.

1. Check to be sure the inverter's power switch is turned off and that no flammable fumes are present.
2. Identify the POSITIVE (+) and NEGATIVE (–) DC power source (battery) terminals.
3. Install a fuse holder or breaker close to the POSITIVE (+) terminal of the DC source (battery).
4. Connect a length of wire on one side of the fuse holder or circuit breaker. Connect the other end of the wire to the POSITIVE (+) terminal of the inverter.
5. Connect a length of wire between the inverter's NEGATIVE (–) terminal and the DC power source NEGATIVE (–) terminal.
6. Connect a short length of wire to the other terminal of the fuse holder or circuit breaker. Mark it "POSITIVE" or "+".
7. Connect the free end of the fuse or breaker wire to the POSITIVE (+) terminal of the DC power source (battery).
8. Insert a fuse appropriate to the inverter in the fuse holder.

9. Test the inverter by turning it on and plugging in a 100 watt lamp or equipment.
10. If the inverter is not properly operating, then refer to the Troubleshooting section of this manual.

⚠CAUTION

- **Loose connectors may cause overheated wires and melted insulation.**
- **Check to make sure you have not reversed the polarity. Damage due to reversed polarity is not covered by our warranty.**

Connection To Load

The Power Inverter is equipped with dual standard North American AC power receptacles. Plug the cord from the equipment you wish to operate into the AC receptacle(s). Make sure the combined load requirement of your equipment does not exceed maximum continuous power.

The Power Inverter is engineered to be connected directly to standard electrical and electronic equipment in the manner described above. Do not connect the Power Inverter to household or RV AC distribution wiring. Do not connect the Power Inverter to any AC load circuit in which the neutral conductor is connected to ground (earth) or to the NEGATIVE of the DC (battery) source.

⚠WARNING
Do not connect to AC distribution wiring!

Operating Tips

For best operating results, the inverter should be placed on a stable, flat surface. A power cord measuring 2 feet (0.61 meters) has been provided for easy positioning of the inverter. (VEC1045/46 features a clip cable of 0.9 meter, vehicle accessory plug cable of 0.6 meter; VEC1047 features a clip cable of 0.9 meters only.)

The inverter should only be used in locations that meet the following criteria:

DRY — Do not allow water or other liquids to come into contact with the inverter.

COOL — Surrounding air temperature should be between –0°C and 40°C — ideally between 15°C and 25°C (60-80°F). Keep the inverter away from direct sunlight, when possible.

WELL-VENTILATED — Keep the area surrounding the inverter clear to ensure free air circulation around the unit. Do not place items on or over the inverter during operation. The unit will shut down if the internal temperature gets too hot.

SAFE — Do not use the inverter near flammable materials or in any locations that may accumulate flammable fumes or gases. This is an electrical appliance that can briefly spark when electrical connections are made or broken.

⚠CAUTION

Rechargeable Devices

Certain rechargeable devices do not operate well from a modified sine wave inverter. They only operate properly from a standard household outlet, which provides a pure sine wave. Therefore, the manufacturer recommends that these types of devices be operated from a standard household outlet only, not from the inverter.

This problem does not occur with most battery-operated equipment. Most of these devices use a separate charger or transformer that is plugged into an AC receptacle. The Power Inverter is easily capable of running most chargers and transformers.

CARE AND MAINTENANCE

Storage

1. Ideal storage temperature range is 50-68°F (10-20°C).
2. Store and use the inverter in a cool, dry place with adequate ventilation.
3. Avoid locations that are exposed to heating units, radiators, direct sunlight or excessive humidity or dampness.

Fuse Replacement

This inverter is equipped with multiple internal fuses. Normally, these fuses will not "blow" unless there is a serious problem inside the unit. Internal fuses are replaceable; however, only trained personnel should attempt fuse replacement. If the unit is damaged during fuse replacement, the warranty may be voided. The manufacturer recommends contacting Technical Support at (800)-618-5178.

TROUBLESHOOTING

Common Audio/Visual Problems

"Buzzing" sound in audio systems

Some inexpensive stereo systems and "boom boxes" emit a buzzing sound from their speakers when operated from the Power Inverter. This occurs because the power supply in the electronic device does not adequately filter the modified sine wave produced by the inverter. The only solution to this problem is to use a higher quality sound system that incorporates a higher quality power amplified supply.

Television Interference

The Inverter is shielded to minimize interference with TV signals. However, in some instances, some interference may still be visible, particularly with weak TV signals. Try the following corrective measures:

- Position the inverter as far as possible from the television, the antenna and the antenna cables. Use an extension cable, if necessary
- Adjust the orientation of the inverter, the antenna cables and the TV power cord to minimize interference
- Make sure that the antenna feeding the television provides an adequate ("snow free") signal and that high quality, shielded antenna cable is used